Tourism management and automation: RFID applications in Brazilian maritime cruises

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Abstract: - The maritime cruise operation in Brazil just had another season in the 2015-2016 summer. In the 2014-2015 season, 549,619 cruise passengers (domestic and international) had used the port departure terminals [1]. Inside the ship, activities such as entertainment, gastronomy and hosting lead to displacement of people, luggage and materials. Also on ground there is an intense movement of travellers guided by the travel agencies and locals. It is during the travel time schedule that this article suggests the use and application of security and traceability technologies through implantation of RFID, in order to provide travellers, service suppliers and surveillance authorities a safety and traceable travel experience.

Key-Words: - tourism, maritime cruise, hospitality, technology, RFID

1 Introduction

Travel is an important economic activity. According to [2], 6,429,852 international tourists entered in Brazil in 2014. 70.6% came by plane, 27.3% by road and 2.1% by maritime and inland waterway. Hence, although it is the less popular mean of transportation, cruises and other maritime and inland waterway transports are responsible for the arrival of approximately 135 thousand people. In addition, the choose for this way of travelling has been increasing thanks to more demanding customers, new life styles (couple without kids, couple with one parent) and elder people [2*].

The international cruise industry expected revenue of US$ 39.6 billion in 2015 and a growth of 6.9%. This growth is fostered by factors such as the increasing in the amount of cruises, bigger capacity of ships and higher prices [1].

In Brazil, the cruise industry started in 1996, with the Constitutional Amendment that reassured the possibility of cabotage services along Brazilian coastline. The effects of the amendment were noticed in Brazil from 1997 onwards [4]. In the ship and on ground, the crew is responsible for the travellers which want to have pleasant experience and demand a range of services and facilities from the beginning until the end of the trip [3]. This hospitality is also linked to satisfaction and security [5]. Therefore, cruises must cover the four hospitality time: nurture, entertain, host and receive [6] and the three hospitality categories: private (domestic), social (public) and commercial [7]. Add

to that, customers are more concerned about security on their stay in the cities during the trip

In this context, the article aims to enlighten opportunities and characteristics of travel plans offered by the cruise industries. It is still not clear how the cruise industry can explore traceability technologies in order to offer a better and safer service for its customer.

2 Cruise tourism in Brazil

Brazil is one of the best conditions for the development of maritime cruise countries. Not a long time ago, most of the cruises were in Caribbean and north American coast. However, because of Brazil potential, due to its environment and coast length, and the signs of saturation in Caribbean [8] Brazil is becoming a famous cruise destination. Roughly 23 million cruisers were expected in 2015, an increase of 4.1% in comparison to 2014. In Brazil, from the total of visitors, 85% were local, which shows the importance of the industry to internal tourism [1].

The research conducted by [1] showed that 93.8% of the passengers landed in at least one stopover, to enjoy the services and tourist attractions of the port and touristic cities. [9] states that the consume habit change of the tourist in Brazil is evident. The tourists are seeing an opportunity of joining several interests and seize new experiences in the cruise industry.

Nevertheless, there are some factors that limit the growth of cruise tourism [1]:

- high operational costs, due to taxes and fees;
- bureaucracy involved;
- port infrastructure.

Regarding port infrastructure, investment on passengers' terminals, structure for ships arrival and explicit differentiation between freight and passenger are some requirements to be improved. The lack of technological tools to manage people and luggage displacements is also observed.

3 Security and hospitality

During the trip, the tourist is looking for entertainment experiences and adventures in controlled and safety environments [10]. The cruise is different from other means of transportation as the passenger moves and has moments of leisure at the same time. He is offered physical, social, intellectual, artistic and manual activities, and has the opportunity to visit numerous cities during the stopovers without packing and looking for accommodation or airport [11]. In this context, security is an indispensable factor, once the ship is not allowed to sail faster and cases like the Costa Concordia concern passengers [11].

Ship operators have the duty of protect all passengers and follow the regulation. A study regarding passengers' security perception conducted in Caribbean coastline showed that travellers feel safe, however safety and security record can be improved and risks mitigated by joint efforts from cruise industry, government from destinations where travellers disembark and cruise passengers. There are approximately 400 incidents per year involving cruise travellers [12]. A global maritime security protocol was established in 2002. Prepared by International Maritime Organization (IMO), an organ linked to United Nations, the protocol seeks to fight against terrorism. It defines security policies in port activities through the International Code for ship and port facilities protection, known as ISPS-CODE. The protocol requires an emergency plan for watercrafts and ports, able to assure people, luggage, freight and containers protection [13]. Besides security, concerns about ecologic and economic implications of cruises are often discussed [3].

In order to achieve new standards, the tourism industry is looking for new technological applications that reduces costs and leads to more sophisticated vacation [3].

4 RFID use and application

Radio Frequency Identification (RFID) is an innovative and non invasive traceability technology that allows automatic and real time collection and share of data [14] to trace and track data about de traced item [15]. It has been in existent for more than 50 years. Bust just recently it has expanded in organizations, driven by the advances in technology.

RFID enables identification, monitoring and control of resources and can modify the management and operation capacity within companies through more optimized process and the possibility of acquiring real-time accurate information [13, 14]. It works by implanting a unique auto-identification technology that allows to store and to recover data in an integrated circuit (chip) through radio frequency waves [16]. This individual ID combines quality management with monitoring and controlling function and enables the traceability for the granularity level required [14].

The basic composition of a RFID system consists of software and support infrastructure, readers, aerials and tags. The tag, also known as transponder, is an integrated circuit comprising a processor, a memory and an aerial that stores data and communicates via radio waves as seen in Figure 1.

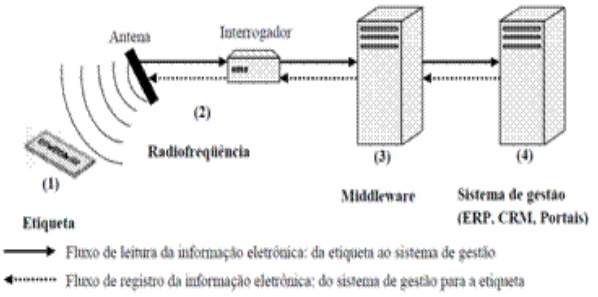

Figure 1. RFID system dynamic [16].

The components of RFID system may be combined to serve different purposes of the organization or other stakeholders, to reduce the time to receive raw materials or to improve the patient flow in a hospital. It allows a fast identification, materials record, integration of managerial systems, and automatic update of warehouse, costs and planning and control systems.

Additionally, in the literature, RFID is used to trace documents, products, boxes, pallets, vehicles, components, containers, animals and people.

The application of RFID traceability with focus on people aims to provide secure information regarding people localization in a trust and quick way. Studies such as the one conducted by [17], presents the vantages of using RFID in healthcare, such as the possibility of receiving on-time information about the patient medical routines outside the hospital, extending the health care concept.

5 Application of RFID in cruise tourism

Application of traceability technologies in tourism is becoming more common. [18] analyze benefits of RFID-based solutions in hospitality; [19] presented an opportunity to theme parks through the understanding of tourist behaviour collected by RFID technology; and [20] conducted a survey in the USA hotel industry to better understand the influence of demographic factors on consumer intention to use RFID.

Despite of major advances on the theme, the use of RFID in cruise tourism is still a gap. Therefore, this study was conducted in order to provide a better understanding of RFID opportunities in the sector.

Data regarding concepts of hospitality, studies and its results about tourism management, maritime cruises and traceability technology applications involving people were analysed, combined and cross-checked in order to establish the relation between RFID technology and hospitality services in maritime cruises.

The planning, control and execution of activities consumed on board and on ground were considered into three dimensions: hospitality time, related services and RFID application opportunities.

5.1 Nurture

The processes that appear to present the most relevant benefits regarding nurture are shown in Table 1.

Table 1. RFID application opportunities in nurturing.

Hospitality time	Related services	RFID application opportunities
Nurture	- Breakfast; - Lunch; - Dinner; - Snack; - Bars; - Other cruise gastronomic event.	- Patterns record of food and restaurant consume in the cities visited (means of transportation used, agency services purchased, restaurant selected) - Control of catering and its storage of materials (food, drink, dishes) - Control of table reservation and waiting time; - Consumers profile identification (age-group, motor or nutritional restriction);

		- Record of travellers requests and opinion regarding catering service; - Control of start and end of restaurant schedule; - Capacity of restaurant control; - Human resources in this area.

The opportunities in nurture involve the stock levels of products and materials, such as the ingredients to cook, beverage and dishes. By tracing these items through RFID technology the crew may programme the replenishment in a more accurate way and focus its efforts in the most needed processes (e.g. decisions to have more resources doing the dishes or serving customers)

In addition, data about customers profile and consumer patterns may help to define the menu (e.g. vegan or vegetarian food, kids' food).

5.2 Entertain

The second hospitality time is entertain, Table 2 presents the opportunities considered.

Table 2. RFID application opportunities in entertainment.

Hospitality time	Related services	RFID application opportunities
Entertain	- Recreation; - Cultural presentations; - Sport activities; - Intellectual activities; - Manual activities; - Games and casinos; - Sightseeing.	- Activities registration control; - Attendees profile identification (age-group, gender, motor, intellectual or physical restriction); - Measurement of productivity; - Control of materials, outfits, and related products; - Control of customers consume and patterns understanding; - Record of travellers requests and opinion regarding entertainment; - Control of entrance and exit; - Record of places visited (inside and outside the ship); - Patterns record of entertainment consume in the cities visited (means of transportation used, agency services purchased, restaurant selected) - Traceability of traveller along all the cruise;

		- Capacity control; - Human resources in this area.

As in nurture, important opportunities are linked to the crew´s ability to analyze the tracked data in order to understand likes and dislikes of travellers. By doing so, it is possible to organize events that will attract a larger number of clients. In this case, more than increasing the revenue through goods sale, the cruise provides a more exciting experience by meeting the customer needs.

Furthermore, the control of capacity and registration may anticipate future problems in the events and activities.

5.3 Host

The processes that appear to present the most relevant benefits in host hospitality time are shown in Table 3.

Table 3. RFID application opportunities in hosting.

Hospitality time	Related services	RFID application opportunities
Host	- Cabins host services	- Check-in and check-out operations; - Accommodations management; - Luggage traceability; - Governance management (cleanliness, interior design, crew management)

		- Record of travellers requests and opinion regarding host services; - Human resources in this area.

Forecasting problems and issues regarding accommodation, facilities and check-in and check-out may outline a great value to the custome or prevent bad experiences.

5.4 Receive (welcome)

The fourth hospitality time is receive, which presents the following opportunities (Table 4.)

Table 4. RFID application opportunities in receiving (welcome)

Hospitality time	Related services	RFID application opportunities
Receive (welcome)	- Parties; - Meetings; - Conferences.	- Guests control; - Table and seats reservations; - Control of materials, outfits, and related products; - Control of start and end of the event schedule; - Human resources in this area

Welcome the crew passengers in parties, meetings and conferences is a big challenge. Everything must be forecasted and planned. During these events RFID technology may be applied in the organization by providing information about guest numbers, their localization and needs.

5.5 Considerations

It is possible to establish the connection between the opportunities listed above and the cruise schedule in Brazilian coastline. Regardless of the cruise period, hospitality services provision have to be provided during the entire travel and affects clients perception.

To achieve competitive advantage within the market, the cruise industry has to organize and manage its human resources, materials and technologies in the open sea in order to meet the scheduling procedures. Therefore, the identification of processes that can be automated and adapted through RFID technology may improve the maritime cruise management and planning.

5 Conclusion

The literature review about tourism management and automation indicated a lack of studies about people technology. In the maritime cruise context, studies involving the application of traceability technology and processes optimization may improve security and enhance the business value.

In addition, should be particularly highlighted that RFID technology allows more easily communication flow between the crew, on-time data that can be shared with authorities and may facilitate decision making process. Nurture, entertain, host and receive (welcome) services provided by the crew and on ground may anticipate consumer needs by understanding the shared information about travellers profile and consume patterns are available.

The materials and products replenishment may also be modified. Through RFID technology the cruise industry can monitor and control the amount and flow of each desired item and predict stock outs. Hence, the cruise crew can plan and programme the items that must be supplied in the next stopover. The replenishment process must be supervised by federal and local authorities to assure pest and disease control. The luggage traceability seems a prominent area. For cruise industry, it facilitates control, reduces effort waste to search a specific luggage and mitigate loss risk. For the traveller, his service perception is positive.

Finally, the development of cell phone applications to virtual tours, local information, direct communication with the crew and provide online financial balance; based on the relations and identification of customer with his ship, may add a great value to the traveller experience.

References:

[1] Cruises Line International Association (CLIA). Cruzeiros Marítimos - Estudo de Perfil e Impactos Econômicos no Brasil Temporada 2014-2015. *Fundação Getúlio Vargas*. Available at: http://www.abremar.com.br/dados-do-setor/ - Access 04/20/2016.

[2] MINISTÉRIO DO TURISMO. Anuário Estatístico do Turismo de 2015. Available at: http://www.dadosefatos.turismo.gov.br/export/sites/default/dadosefatos/anuario/downloads_anuario/Anuario_Estatistico_de_Turismo_2015_-_Ano_base_2014_-_Pdf.pdf - Access : 09/29/2015.

[3] M. Mazilu, N. Mastorakis. The Romanian Tourism: A Promoter of Globalization and Sustainable Development Factor. *WSEAS Press*, p. 454, 2012.

[4] F. B. Leal, M. F. Soares, N. Pacheco, T. Catramby, T. V. Guimarães. O mercado de cruzeiros marítimos no Brasil: uma análise da demanda potencial no estado do Rio de Janeiro. *Revista Observatório de Inovação do Turismo*, 3, 3, 2012, pp. 17-38.

[5] J. Brillat-Savarin. A fisiologia do gosto. São Paulo: *Companhia das Letras*, 2001.

[6] L. O. L. Camargo, A pesquisa em hospitalidade. São Paulo: *Revista Hospitalidade*, 2, 5, 2008, pp. 15-51.

[7] M. Lashley. Em busca da hospitalidade: perspectivas para um mundo globalizado. São Paulo: *Manole*, 2005.

[8] C. Cooper, D. Gilbert, S. Wanhill, J. Fletcher, R. Shepherd, Turismo: princípios e práticas. Porto Alegre:*Ed. Bookman*., ed.2, 2007.

[9] R. C. N. Amaral, Uma análise do mercado de cruzeiros marítimos evolução, expansão, e previsão no Brasil e no mundo. São Paulo: ECA-USP, doctoral thesis, 2009.

[10] R. Zaina Junior, Eventos: a hospitalidade como experiência de consumo pelos sentidos. Cão Paulo: *Revista Hospitalidade*, 2, 2, 2005, pp. 113-129.

[11] O. C. F. Ribeiro, Os navios de Cruzeiros marítimos enquanto campo de atuação do

profissional de lazer. Belo Horizonte: *Revista Licere*, 14, 2011, pp. 1.

[12] D. Baker, Cruise passengers' perceptions of safety and security while Cruising the Western Caribbean. *Revista Rosa dos Ventos*, 5, I, 2013, pp. 140-154.

[13] P. Z. Zancul, Integração de sistemas de controle de cargas em ambiente portuários. São Paulo: USP, master thesis, 2006.

[14] G. Aiello, M. Enea, C. Muriana, The expected value of the traceability information. *European Journal of Operational Research*, 244, 2015, pp. 176–186.

[15] R. Chen, C. Chen, K. C. Yeh, Y. Chen, C. Kuo, Using RFID Technology in Produce Traceability. *Mathematical methods, computational techniques, non-linear systems, intelligent systems*, 2008.

[16] D. H. Barbosa, Desenvolvimento de um modelo de referência para a aplicação da tecnologia RFID na logística de ambulatórios de ensino. São Carlos: USP doctoral thesis 2012.

[17] C. Lai, S. Chien, S. Chen, K. Fang. The Application of RFID on Inpatient Medication Administration to Improve Patient Safety and Reduce Adverse Drug Events. Greece: *8th WSEAS International Conference on Applied Informatics and Communications*, 2008, pp. 20-22.

[18] B. Öztaysi; S. Baysan; F. Akpinar. Radio Frequency Identification (RFID) in Hospitality. Technovation, 29, 2009, pp. 618–624.

[19] C. Tsai; S. Chung. A personalized route recommendation service for theme parks using RFID information and tourist behavior. Decision Support Systems, 52, 2012, pp. 514–527.

[20] A. Aluri; R. Palakurthi. The influence of demographic factors on consumer attitudes and intentions to use RFID technologies in the US hotel industry. Journal of Hospitality and Tourism Technology, 2, 3, 2011, pp. 188 – 203.